EXHAUST SYSTEM EMISSION CONTROLS

EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING

NOTE:

- **After exhaust system repairs, make sure exhaust system is not under stress and that it has sufficient clearance from the bodywork. If necessary, loosen double clamps and align muffler and exhaust pipe so that sufficient clearance is maintained to the bodywork and mounts carry uniform loads.**
- **Do not use any silicone sealant. Traces of silicone components which are sucked into the engine are not burned there, and they damage the oxygen sensor.**
- **Always replace self-locking nuts.**
- **Components marked with * are tested via On Board Diagnostic (OBD). See DIAGNOSTIC MODE 3: CHECK DTC MEMORY .**

Exhaust manifold, front exhaust pipe with Three Way Catalytic Converter (TWC) and attachments:

- Vehicles with engine code AEG. See **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Vehicles with engine code AVH, AZG, BDC **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .

Mufflers with mounts. See **MUFFLERS WITH MOUNTS** .

Check catalytic converter. See **CATALYTIC CONVERTER, CHECKING** .

Exhaust manifold, front exhaust pipe with Three Way Catalytic Converter (TWC) and attachments (vehicles with engine code AEG)

NOTE: The following list refers to Fig. 1 .

1. **Combination valve**
   - Checking. See **COMBINATION VALVE, CHECKING** .

     Vehicles with engine code AEG as of 06.99:

   - without vacuum connection to Secondary Air Injection (AIR) solenoid valve -N112-
2. **10 Nm**

3. **25 Nm**
4. **30 Nm**
5. **25 Nm**
    - replace
6. **Connection tube**
7. **Connecting piece, 35 Nm**
8. **4-pin harness connector**
    - Black
    - For Heated Oxygen Sensor (HO2S) 1 before Three Way Catalytic Converter (TWC) -G39- and Oxygen Sensor (O2S) heater -Z19-
    - Component location: At right vehicle underside
    - Component location: At right vehicle underside
9. **Heated Oxygen Sensor (HO2S) -G39- bank 1*, 50 Nm**
    - Component location: in front catalytic converter
    - Only use "G 052 112 A3" to grease thread; do not let "G 052 112 A3" get onto slit of oxygen sensor
    - Voltage supply of oxygen sensor heater via Fuel Pump (FP) Relay -J17-
    - Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
    - Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
10. **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- bank 1*, 50 Nm**
    - Component location: In rear catalytic converter
    - Only use "G 052 112 A3" to grease thread; do not let "G 052 112 A3" get onto slit of oxygen sensor
    - Voltage supply of oxygen sensor heater via Fuel Pump (FP) Relay -J17-
    - Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
    - Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .
11. **4-pin harness connector**
    - brown
    - For Heated Oxygen Sensor (HO2S) 2 behind Three Way Catalytic Converter (TWC) -G130- and heater for lambda-probe 1 -Z29-
    - Component location: At right vehicle underside
12. **to front muffler**

- See item 1 .

13. **Front exhaust pipe with catalytic converter**
    - Check catalytic converter. See **CATALYTIC CONVERTER, CHECKING** .
14. **40 Nm**
    - replace
15. **Bracket**
16. **Seal**
    - replace
17. **Exhaust manifold**
18. **Heat shield**

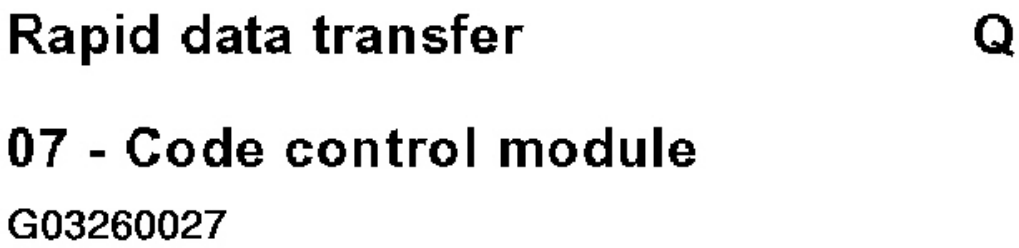

Fig. 1: Identifying Exhaust Manifold, Front Exhaust Pipe With Three Way Catalytic Converter And Attachments (Vehicles With Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Exhaust manifold, front exhaust pipe with Three Way Catalytic Converter (TWC) and attachments (vehicles with engine code AVH, AZG, BDC)

NOTE: The following list refers to Fig. 2 .

1. **Heat shield**
2. **Heated Oxygen Sensor (HO2S) -G39- bank 1*, 50 Nm**
    - Component location: In exhaust manifold
    - Use "G5" to grease thread only; do not let "G5" get onto slits of oxygen sensor body
    - Voltage supply of oxygen sensor heater via Fuel Pump (FP) Relay - J17-
    - Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
    - Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter

(TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

3. **10 Nm**
4. **25 Nm**
5. **25 Nm**
   - replace
6. **Connection tube**
7. **Connecting piece, 35 Nm**
8. **Exhaust manifold**
9. **Seal**
   - replace
10. **Front exhaust pipe with catalytic converter**
    - Check catalytic converter. See **CATALYTIC CONVERTER, CHECKING** .
11. **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130- bank 1*, 50 Nm**
    - Component location: In rear catalytic converter
    - Only use "G 052 112 A3" to grease thread; do not let "G 052 112 A3" get onto slit of oxygen sensor
    - Voltage supply of oxygen sensor heater via Fuel Pump (FP) Relay - J17-
    - Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
    - Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .
12. **10 Nm**
13. **Heat shield**
    - for catalytic converter
14. **10 Nm**
15. **Spring nut**
16. **Suspended mount**
17. **25 Nm**
18. **40 Nm**
    - replace
19. **Seal**
    - replace

Code Control Module

Enter code number XXXXX (0-32000)

G03260028

Fig. 2: Identifying Exhaust Manifold, Front Exhaust Pipe With Three Way Catalytic Converter And Attachments (Vehicles With Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Mufflers with mounts

NOTE: The following list refers to Fig. 3 .

1. **From Three Way Catalytic Converter (TWC)**
2. **Double clamp**
   - replace
   - Note installed position. See **Installation position of double clamp** .
3. **25 Nm**
4. **Suspended mount**
   - Note installed position. See **Installation position of muffler suspension** .
5. **Front muffler**
   - At factory, front and rear mufflers are installed as a single component. Replacement front and rear mufflers are supplied separately, with replacement double clamp for connecting joint.
   - Install front muffler parallel. See **Aligning front muffler parallel** .
6. **Separating point**
   - Separation point at exhaust pipe. See **Separation point at exhaust pipe** .
7. **Suspended mount**
8. **Bracket**
9. **Rear muffler**
   - At factory, front and rear mufflers are installed as a single component. Replacement front and rear mufflers are supplied separately, with replacement double clamp for connecting joint.
10. **Suspended mount**
    - With retainer ring

11. **20 Nm**
12. **Tunnel bridge**
13. **40 Nm**
14. **Washer**

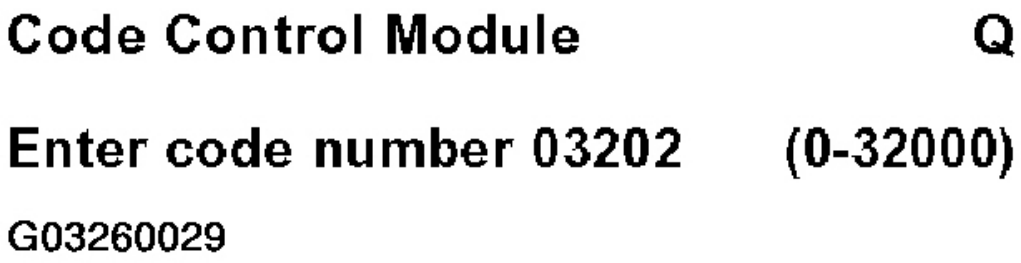

Fig. 3: Identifying Mufflers With Mounts Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installation position of double clamp

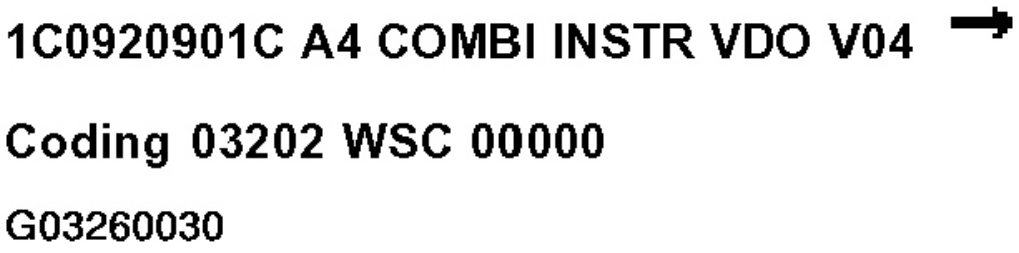

Fig. 4: Identifying Installation Position Of Double Clamp
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Work procedure

- Position new double clamp as shown with approx. 5 mm distance to marking -A- and tighten it. Tightening torque 40 Nm
  - Marking A (arrow 1) for vehicles with automatic transmission

- Marking S (arrow 2) for vehicles with manual transmission

Installation position of muffler suspension

- Angled side at foot of suspension (arrow) faces front of vehicle.

Fig. 5: Identifying Installation Position Of Muffler Suspension
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Separation point at exhaust pipe

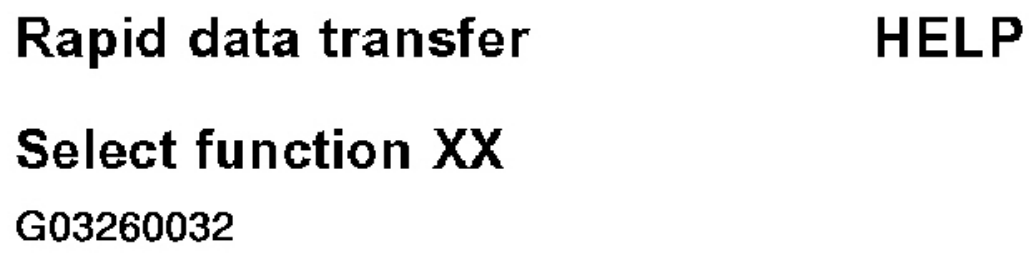

Fig. 6: Identifying Separation Point At Exhaust Pipe
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Recommended special tools and equipment

- Body saw, e.g. VAG1523

Work procedure

- Separate exhaust pipe at right angle to separation point (arrow 2).
- Position replacement double clamp -4- in installation position at the edge markings (arrows 1 and 3) as shown when installing. Tightening torque 40 Nm

Aligning front muffler parallel

- Mounting bolt at exhaust pipe must be parallel to tunnel bridge (dimension -x- same at left and right).

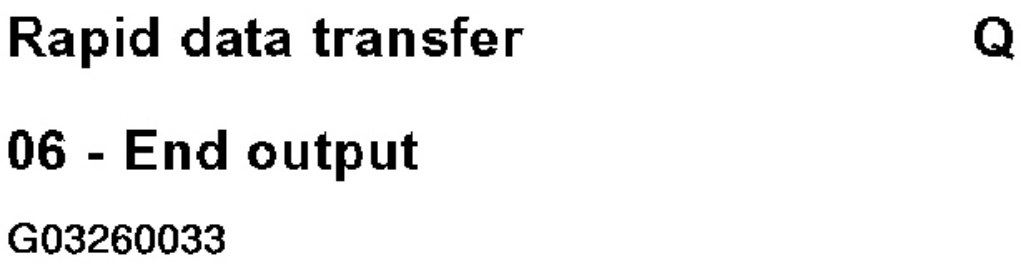

Fig. 7: Aligning Front Muffler Parallel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Catalytic converter, checking

Function test

- Select the measuring value "Test-ID 01: Catalytic converter" and check whether the specified values are being reached. See **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED** .
- End diagnosis and switch ignition off.

If the specified values are exceeded:

- Replace the front exhaust pipe with catalytic converter:

- Vehicles with engine code AEG. See item 13 .
- Vehicles with engine code AVH, AZG, BDC. See item 10 .

Continuation for all vehicles

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

SECONDARY AIR INJECTION (AIR) SYSTEM

WARNING: Observe the following for all installations, especially in engine

compartment due to lack of room:

- **Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.**
- **Watch for sufficient clearance to all moving or hot components.**

Function

Air is blown behind the exhaust valves by the Secondary Air Injection (AIR) system during a cold start. Thereby, the emission gas is enriched with oxygen, initiating a secondary combustion and thereby shortening the warm-up phase of the catalytic converter. Activation occurs from Motronic Engine Control Module (ECM) -J220- via Secondary Air Injection (AIR) Pump Relay -J299- to combination valve.

Secondary Air Injection (AIR) system components, removing and installing:

- Vehicles with engine code AEG, AVH, AZG. See **PARTS OF SECONDARY AIR INJECTION (AIR) SYSTEM, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE AEG, AVH, AZG)** .
- Vehicles with engine code BDC. See **PARTS OF SECONDARY AIR INJECTION (AIR) SYSTEM, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE BDC)** .

Check secondary air system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** .

Parts of Secondary Air Injection (AIR) system, removing and installing (Vehicles with engine code AEG, AVH, AZG)

NOTE: Components marked with * are tested via On Board Diagnostic (OBD). See DIAGNOSTIC MODE 3: CHECK DTC MEMORY .

NOTE: The following list refers to Fig. 8 .

1. **Connector**
   - only for vehicles with engine code AEG up to 05.99
   - black, 2-pin
   - for Secondary Air Injection (AIR) solenoid valve
   - before disconnecting, mark allocation to component
2. **Secondary Air Injection (AIR) Solenoid Valve -N112-***
   - only for vehicles with engine code AEG up to 05.99
   - Checking. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .
3. **to fork of vacuum line for brake booster**
   - only for vehicles with engine code AEG up to 05.99

- Check for secure fitting

4. **Secondary Air Injection (AIR) Pump Relay -J299-***
5. **O-ring**
   - Replace if damaged
6. **Pressure hose**
   - Check for secure fitting
   - To disengage, squeeze together at front
7. **Intake hose**
   - Check for secure fitting
   - To disengage, squeeze together at front
   - from upper air filter housing. See item 6 in **AIR FILTER, DISASSEMBLING AND ASSEMBLING (VEHICLES WITH ENGINE CODE AEG, AVH, AZG)** .
8. **Secondary Air Injection (AIR) Pump Motor -V101-***
   - Checking. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** .
9. **10 Nm**
10. **Bracket**
    - For Secondary Air Injection (AIR) pump motor
    - secured to lower part of intake manifold at bottom
11. **Connector**
    - 2-pin
    - For Secondary Air Injection (AIR) pump motor
12. **25 Nm**
13. **Lower part of intake manifold**
14. **to connecting piece at exhaust manifold**

    Vehicles with engine code AEG:

    - See item 7 .

      Vehicles with engine code AVH; AZG:

    - See item 7 .
15. **30 Nm**
16. **Connection tube**
17. **Connecting piece, 35 Nm**
18. **Heat shield**
19. **Seal**
    - replace
20. **Combination valve**

- Checking. See **COMBINATION VALVE, CHECKING** .

  Vehicles with engine code AEG as of 06.99:

- without vacuum connection to Secondary Air Injection (AIR) solenoid valve -N112-

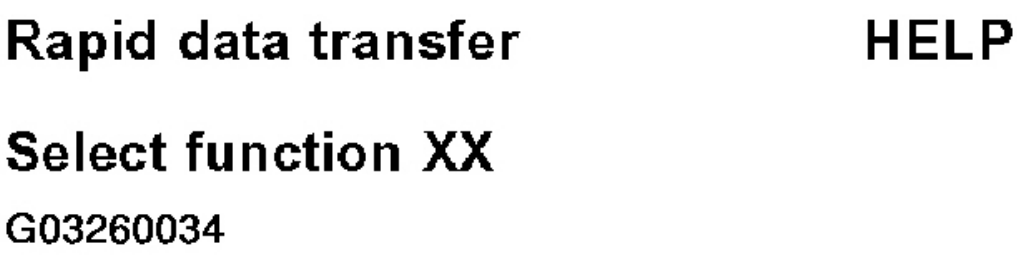

Fig. 8: Identifying Parts Of Secondary Air Injection System (Vehicles With Engine Code AEG, AVH, AZG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Parts of Secondary Air Injection (AIR) system, removing and installing (Vehicles with engine code BDC)

NOTE: Components marked with * are tested via On Board Diagnostic (OBD). See DIAGNOSTIC MODE 3: CHECK DTC MEMORY .

NOTE: The following list refers to Fig. 9 .

1. **Combination valve**
   - Checking. See **COMBINATION VALVE, CHECKING** .
   - To replace, remove warm air collector plate
2. **O-ring**
   - Replace if damaged
3. **Pressure hose**
   - Check for secure fitting
   - to disengage, squeeze together at front
4. **Intake hose**
   - Check for secure fitting
   - To disengage, squeeze together at front
5. **To upper part of air filter**

- See item 3 in **AIR FILTER, DISASSEMBLING AND ASSEMBLING (VEHICLES WITH ENGINE CODE BDC)** .

6. **Secondary Air Injection (AIR) Pump Motor -V101-***
   - Checking. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** .
   - Activation via Secondary Air Injection (AIR) Pump Relay -J299-*. See **Secondary Air Injection (AIR) pump relay -J299-* (arrow)** .
7. **Connector**
   - 2-pin
   - For Secondary Air Injection (AIR) pump motor
8. **10 Nm**
9. **25 Nm**
10. **15 Nm**
11. **Bracket**
    - For Secondary Air Injection (AIR) pump motor
    - secured to lower part of intake manifold at bottom
12. **Lower part of intake manifold**
13. **10 Nm**
14. **to connecting piece at exhaust manifold**
    - See item 7 .
15. **30 Nm**
16. **Connection tube**
17. **Connecting piece, 35 Nm**
18. **Warm air collector plate**
    - With intake manifold support
    - With mount for combination valve
19. **Seal**
    - replace

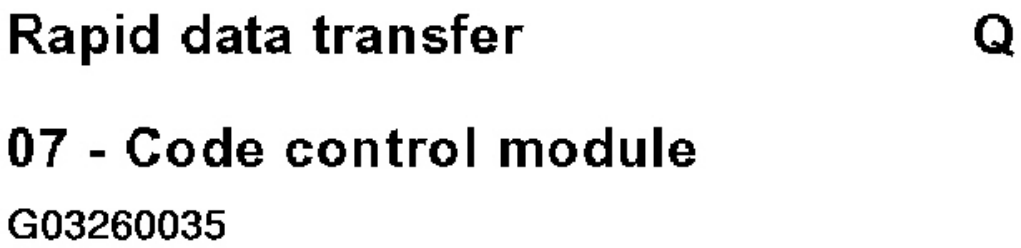

Fig. 9: Identifying Parts Of Secondary Air Injection System (Vehicles With Engine Code BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Secondary Air Injection (AIR) pump relay -J299-* (arrow)

In protective housing for relays in engine compartment (inserted in wiring beside master brake cylinder).

NOTE:

- **Remove battery Ground (GND) strap if tools are necessary for removal of relays or control modules from the relay carrier.**
- **Obtain radio code for radios with anti-theft coding before disconnecting battery.**
- **Checking relay activation:**

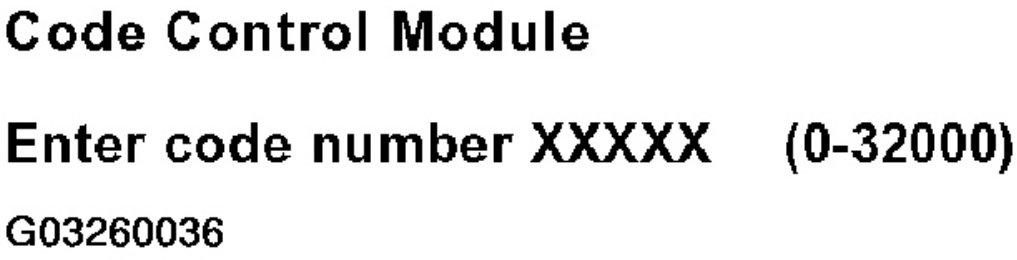

Fig. 10: Identifying Secondary Air Injection (Air) Pump Relay -J299-
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Secondary Air Injection (AIR) system, checking for proper seal

Function test

- Select the measuring value "Test-ID 03: Secondary Air Injection (AIR) system" and check whether the specified values are being reached. See **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED** .
- End diagnosis and switch ignition off.

If the specified values are not reached:

Checking Proper Seal

- Check the connection pipes and hoses between Secondary Air Injection (AIR) pump motor and combination valve for proper seal.

  Secondary Air Injection (AIR) system components, removing and installing:

  - Vehicles with engine code AEG, AVH, AZG. See **PARTS OF SECONDARY AIR INJECTION (AIR) SYSTEM, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE AEG, AVH, AZG)** .
  - Vehicles with engine code BDC. See **PARTS OF SECONDARY AIR INJECTION (AIR) SYSTEM, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE BDC)** .
- Repeat function test.
- Check hoses and hose connections for secure seating.
- Repeat function test.

If malfunction is no longer present:

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Secondary Air Injection (AIR) Solenoid Valve (Vehicles with engine code AEG up to 05.99), checking

Solenoid valve is closed when no voltage is present.

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- Main fuses must be OK.

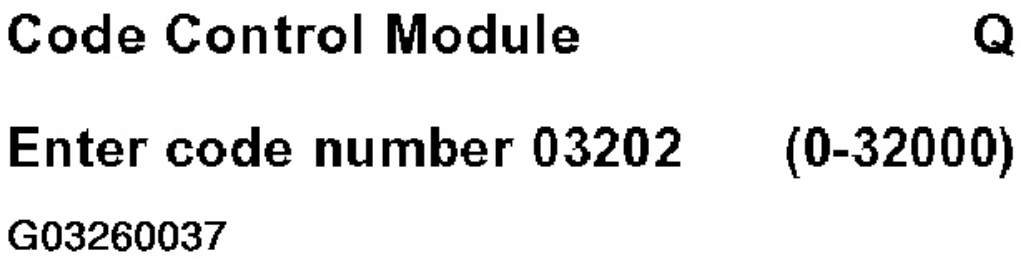

Fig. 11: Identifying Main Fuses (Secondary Air Injection Solenoid Valve: Engine Code AEG Up To 05.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Ignition switched off.

Test sequence

- Disconnect 2-pin connector from Secondary Air Injection (AIR) Solenoid Valve -N112- (arrow).

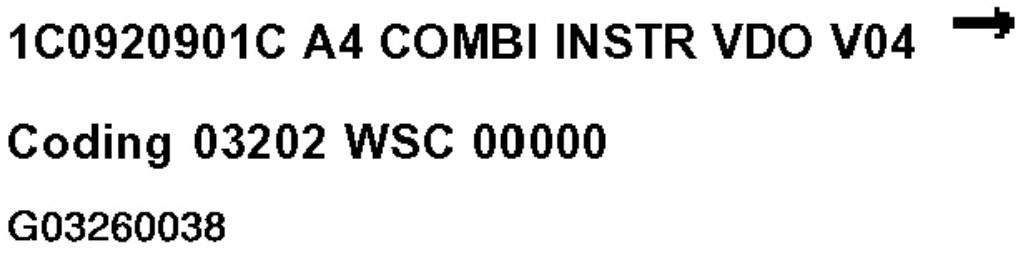

Fig. 12: Disconnecting 2-Pin Connector From Secondary Air Injection Solenoid Valve -N112- (Engine Code AEG: Up To 05.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance between terminals of solenoid valve.

  Specified value: 25,0...35,0 ohm

Fig. 13: Measuring Resistance Between Terminals Of Secondary Air Injection Solenoid Valve (Engine Code AEG: Up To 05.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If specified value is not obtained:

- Replace Secondary Air Injection (AIR) Solenoid Valve -N112-. See item 2 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If specified value is obtained:

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .
- Check wire between test box socket 33 + 2-pin connector terminal 2 for open circuit according to wiring diagram. Wire resistance: max. 1.5 ohm

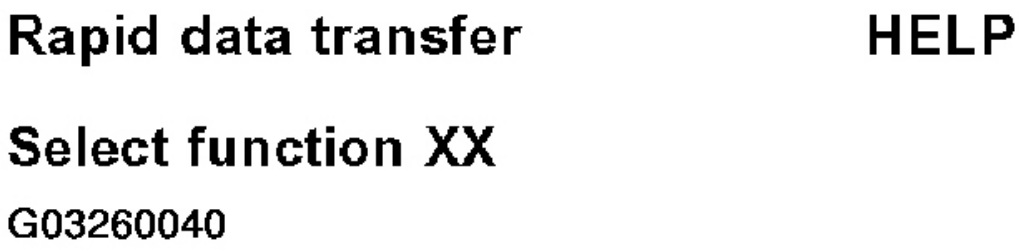

Fig. 14: Identifying Secondary Air Injection Solenoid Valve 2-Pin Harness Connector Terminals (Engine Code AEG: Up To 05.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check the wire for short circuit to B+ and Ground (GND).

Specified value: INFINITY ohm

- Check wire between 2-pin connector terminal 1 and the Fuel Pump (FP) Relay -J17- for open circuit according to wiring diagram. Wire resistance: max. 1.5 ohm

  If no malfunctions are found in wires:

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

Secondary Air Injection (AIR) pump motor, checking

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- Main fuses must be OK.

Fig. 15: Identifying Main Fuses (Secondary Air Injection Pump Motor)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fuel Pump (FP) Relay -J17- must be OK.
- Secondary Air Injection (AIR) Pump Relay -J299- must be OK.
- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.

- Ignition switched off.

Test sequence

- Remove front noise insulation.
- Disconnect 2-pin connector from motor for secondary air pump (arrow).

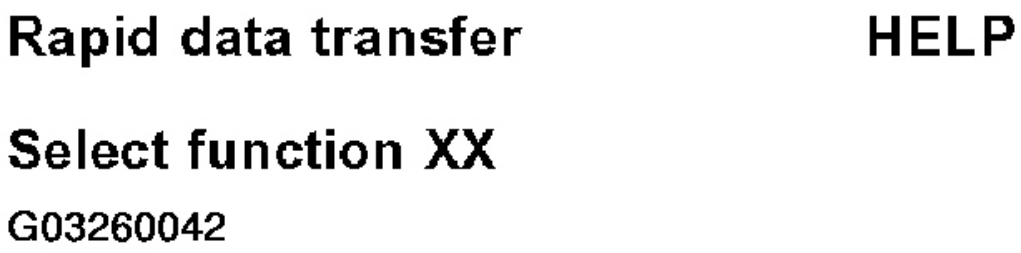

Fig. 16: Disconnecting 2-Pin Connector From Motor For Secondary Air Pump
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Disconnect pressure hose at Secondary Air Injection (AIR) pump motor (arrow).

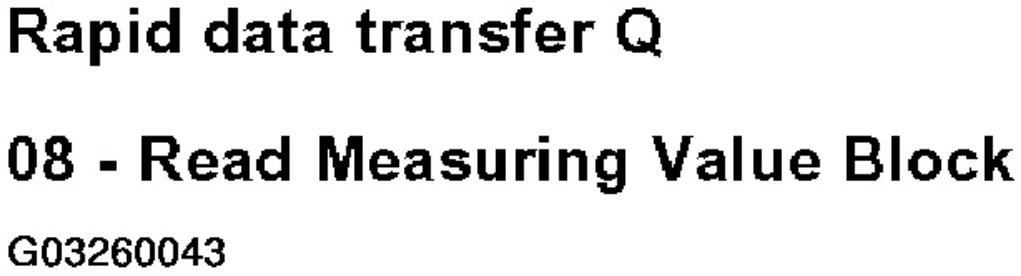

Fig. 17: Disconnecting Pressure Hose At Secondary Air Injection Pump Motor
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: To disengage, compress the buttons at the hose coupling.

- Connect Secondary Air Injection (AIR) Pump Motor to the B+ and Ground (GND) terminals of the

battery using the respective adapter cables.

The Secondary Air Injection (AIR) Pump Motor must start up and air must escape at compressed-air connection (arrow).

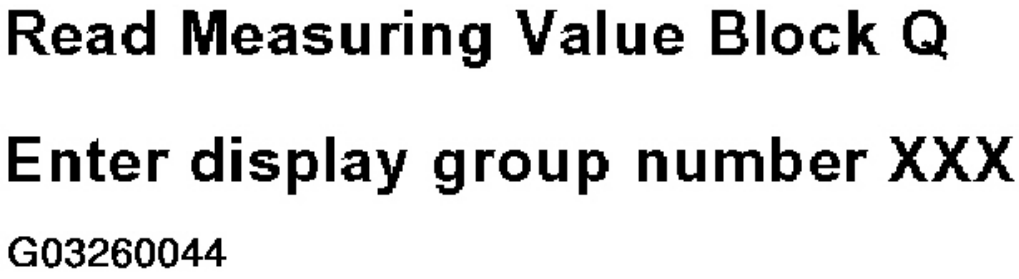

Fig. 18: Connecting Secondary Air Injection Pump Motor To B+ And Ground Terminals Of Battery
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If the motor does not start up, or no air or only very little air escapes:

- Disconnect connection between Secondary Air Injection (AIR) Pump Motor and battery.
- Replace Secondary Air Injection (AIR) Pump Motor -V101-:
  - Vehicles with engine code AEG, AVH, AZG. See item 8 .
  - Vehicles with engine code BDC. See item 6 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If motor starts, and air escapes:

- Disconnect connection between Secondary Air Injection (AIR) Pump Motor and battery.
- Remove Secondary Air Injection (AIR) pump relay from relay carrier in protective housing for control modules:
- Vehicles with engine code AEG, AVH, AZG. See item 4 .
- Vehicles with engine code BDC. See **Secondary Air Injection (AIR) pump relay -J299-* (arrow)** .

NOTE:

- **Remove battery Ground (GND) strap if tools are necessary for removal of**

relays or control modules from the relay carrier.

- **Obtain radio code for radios with anti-theft coding before disconnecting battery.**

Continuation for all vehicles

- Check wire between terminal 2 of relay carrier and terminal 2 of 2-pin connector of Secondary Air Injection (AIR) Pump Motor for open circuit according to wiring diagram. Wire resistance: max. 1.5 ohm

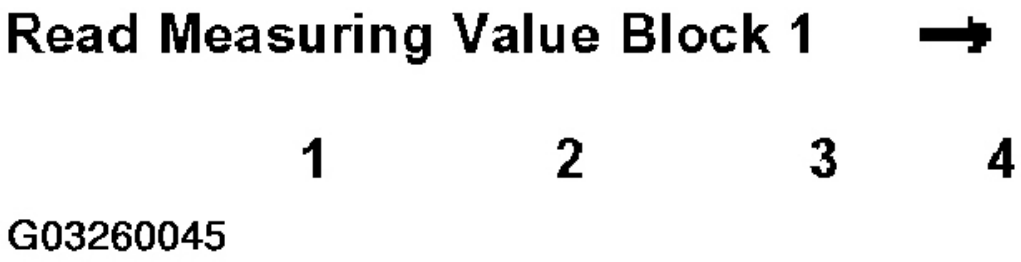

Fig. 19: Identifying Secondary Air Injection Pump Motor Wiring Harness Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check the wire for short circuit to B+ and Ground (GND). Specified value: INFINITY ohm
- Check wire between 2-pin connector terminal 1 and Ground (GND) for open circuit according to wiring diagram. Wire resistance: max. 1.5 ohm

If no malfunctions are found in wires:

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

Combination valve, checking

Vehicles with engine code AEG up to 05.99:

Vehicles with engine code AEG as of 06.99, AVH, AZG, BDC. See **Vehicles with engine code AEG as of 06.99, AVH, AZG, BDC** .

Recommended special tools and equipment

- VAG1390 Hand Vacuum Pump

Test requirements

- No leaks in vacuum lines or hose connections.
- Vacuum hoses not clogged or kinked
- Pressure hose for Secondary Air Injection (AIR) Pump Motor not clogged or kinked

Test sequence

NOTE: Do not use pressurized air for the following test!

- Remove front noise insulation.
- Disconnect vacuum hose -1- from combination valve at Secondary Air Injection (AIR) solenoid valve (N112) -2-. See **Fig. 20** .

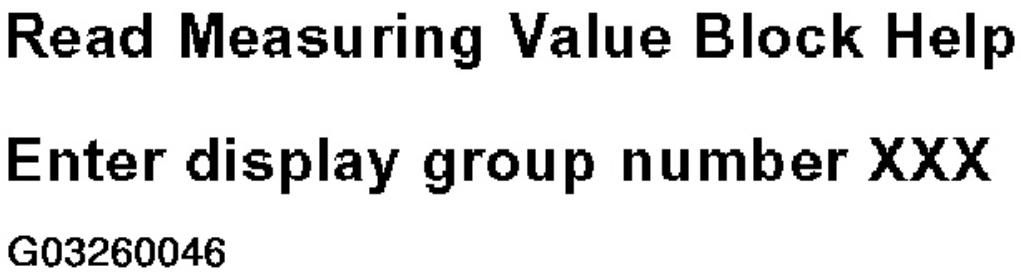

Fig. 20: Testing Combination Valve At Secondary Air Injection Solenoid Valve (Engine Code AEG: Up To 05.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect hand vacuum pump (VAG1390) at vacuum hose -1- to combination valve.
- Disconnect pressure hose at Secondary Air Injection (AIR) pump motor (arrow) and blow into it with light pressure. Combination valve must close.

NOTE: To disengage, compress the buttons at the hose coupling.

- Operate vacuum pump. Combination valve must open.

If the combination valve does not open or it is constantly open:

- Replace combination valve. See item 20 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Vehicles with engine code AEG as of 06.99, AVH, AZG, BDC

Test requirements

- Pressure hose for Secondary Air Injection (AIR) Pump Motor not clogged or kinked
- Hose connections must be properly sealed.

Test sequence

NOTE: Do not use pressurized air for the following test!

- Remove front noise insulation.
- Disconnect pressure hose (arrow) from Secondary Air Injection (AIR) pump motor.

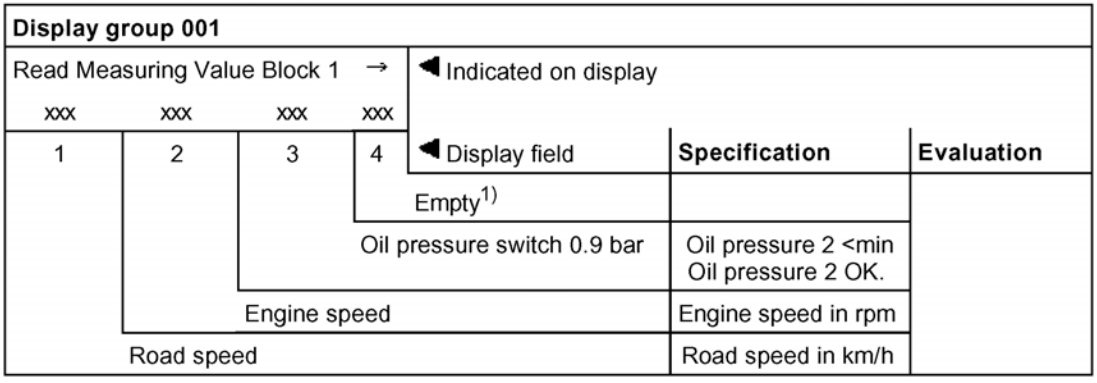

Fig. 21: Disconnecting Pressure Hose From Secondary Air Injection Pump Motor (Engine Code AEG From 06.99, And Engine Codes AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: To disengage, compress the buttons at the hose coupling.

- Blow with light pressure into pressure hose to combination valve. Combination valve must close.
- Blow with high pressure into pressure hose to combination valve. Combination valve must open.

If the combination valve does not open or it is constantly open:

- Replace the combination valve:
  - Vehicles with engine code AEG, AVH, AZG. See item 20 .
  - Vehicles with engine code BDC. See item 1 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

- Generate readiness code. See **READINESS CODE, GENERATING** .